

Environmental Consideration in Cambodia

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ABSTRACT

- The NR-1 is a part of Asian Highway Route No.1 connecting Ho Chi Minh City and Bangkok via Phnom Penh.
- The NR-1 is under improvement.
- The river crossing point at Neak Loeung is becoming the bottleneck of the traffic, which may hinder development of Cambodia.

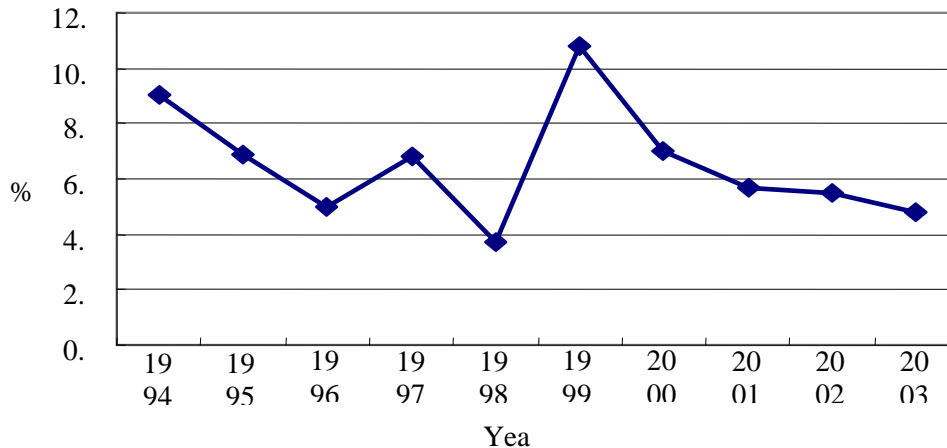
EIA Study on the Second Mekong Bridge

- Mitigation Measures (Natural Environment)
 - Maintenance of comfortable roadside environment
 - Alleviation of disturbance of regional hydrological balance
 - Alleviation of secondary impacts of a large-scale subsidence around the approach roads.
 - Minimize the risk of the erosion of road bank of approach roads and the erosion of the riverbank
 - Alleviation of disturbance of natural fauna/flora condition over the Mekong floodplain and the Mekong River
 - Harmonization of new transport facilities with surrounding communities.
- Mitigation Measures (Social Environment)
 - Comprehensive Regional Development Programme
 - Smooth Transfer and Training Programmed Neak Loeung Ferry Staff (Who will lose jobs)
 - Credit and Saving Program for Small-scale Business for Local Traders and Farmers
 - Comprehensive HIV/AIDS Prevention Package for Construction Workers and Local Communities
- Framework for Resettlement Action Plan (RAP)
 - The number of PAPs is 260 house owners and land owners with 270 assets.
 - The compensation/mitigation measures comprise for: 1) Loss of land, 2) Loss of structures, 3) Loss of productive trees, 4) Loss of commune and public assets, and 5) Allowances for disruption/resettlement and for vulnerable households.
 - Tentative cost estimate for RAP amounts to 0.67 million USD.
 - The result of “Simple Survey” was that out of 270 assets, 98.90% (3 cases) were in agreement to the Project

1. INTRODUCTION

Population: About 14 Million in 2009 and annual growth rate of population was 3.5 %.

GDP: GDP per capita was \$1,649 in 2002 (PPP) and average growth rate was 6.5% from 1994 to 2003.



At present, the Ministry of Public Works and Transport (MPWT) of the Royal Government of Cambodia is Implementing bilateral and multilateral donor-funded road and bridge construction projects. The nominee is presently working for coordinating the EIA process for the MPWT's development projects in the transport sector. Cambodia has been undergoing remarkable political, economic and social changes since the peace agreement in 1991 and the first post-conflict national elections in 1993. Due to the shift to market-oriented economy, financial and technical assistance by international aid donors and foreign investment, Cambodian economy has started to cover.

The NR-1 is a part of Asia Highway Route No.1 connecting Ho Chi Minh City and Bangkok via Phnom Penh. The National Road No. 1 currently being improved under the support by ADB (between Neak Loeung and the Viet Nam border) and Japanese Grant Aid (between Neak Loeung and Phnom Penh). The crossing point of the Mekong River at Neak Loeung is becoming a bottleneck to the transportation of both goods and people, and which consequently hinders the development of Cambodia and neighboring countries. The project is, accordingly, expected to accelerate the mobility of goods and passengers and generate substantial benefits to the region and Cambodia.

2. ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

EIA is managed by Department of Environment Impact Assessment and revised by Ministry of Environment.

- EIA examine new and existing project and project approval.
- Project Owner should prepare the EIA report and revise within 30 days.

Workflow of EIA Procedure

- EIA preparation
- EIA Payment
- Field Study
- Licensing (EIA)

MPWT is the agency to do the planning and implementation of infrastructure projects all over Cambodia including road, port and railway and the number of EIA reports prepared for those project varied from year to year but normally limits to 5-8 annually

(a) A Study on Construction of the Second Mekong Bridge

(b) Project outline

The Study on Construction of the Second Mekong Bridge in Cambodia was conducted to examine the optimum solution to improve traffic capacity across Mekong River at Neak Loeung, of which will be a bottleneck of transport along the National Road No.1 which is the part of Asian Highway.

(c) Location: Neak Loeung

(d) Target Year: 2020

(e) Socio-economic Framework

-3 development scenarios: High (8%p.a), Medium:6% and Low:4%

Traffic Demand Forecast

- Current Traffic Flow=2,376 PC

-Forecast: 2010=3,629 PCU; 2015=7,202

(f) Preliminary Engineering Design

PCU; 2020=9,615 PCU

Highway Design

-By AASHTO Design Standard and past project, 2 lanes of carriageway and motorbike with design speed of 80 Km/h was recommended.

*** Bridge Design**

- Vertical Clearance=37.5m

- Horizontal Clearance=180m

- Cable Stay Bridge were selected by considering various factor such as construction cost and number of piers in the river etc.

(g) Total length of the Project

- Approach Road=3200m (East=2400m;West=800m)

- Main Bridge=600m

-Approach Bridge=1620m (East=660m;West=960m)

(h) Project Cost and Implementation Plan

- Total project cost is US\$74 Million including land acquisition and de-mining and UXO clearance cost.

- Overall implementation period is about 6years with construction period 45 months.

(i) Economic and Financial Evaluation

- EIRR=23%

- When the traffic demand decreases 20% and the project cost increase 20%--EIRR will be about 16.8%.So, high priority should be given to implementation to promote economic and social economic development in Cambodia.

The results of financial analysis show low FIRR of 6.6%.

Therefore, the project will not be attractive for private sector to invest without support by Government.

The guidelines refer to a wide range of natural and social impacts covering 13 natural environmental items as well as 12 social environmental items. Table 7.1.1 and Table 7.1.2 compare the applications of scoping in case of i) the full-coverage by the requirement of the JICA guidelines, ii) the preliminary scoping at the time of S/W mission in December2003, and iii) the proposed scoping agreed among stakeholders in May 2004. Although some impacts to be assessed are deleted from the list in December 2003, the full-coverage of the impact to be assessed stipulated by the guideline was propose, taking into account whatever possible impact might be provoked by the alternative crossing routes and methods at Neak Loeung .

Table 7.1.1 Scoping for IEE-Level Study on Natural Environment

No.	Impacts to be Assessed	Guidelines Requirement	Scoping at S/W Mission (December 2003)	Agreed Scoping at Kick-Off stakeholders Meeting (May 2004)
1	Air quality		x	x
2	Water Quality(Surface/Subsurface Water and Groundwater)	x	x	x
3	Soil and Sedimentation Quality	x	x	x
4	Waste Disposal	x	x	x
5	Noise and Vibration	x	x	x
6	Subsidence	x	x	x
7	Bad Smells	x	x	x
8	Topography and Geology	x	x	x
9	River Bed Materials	x	x	x
10	Fauna and Flora	x	x	x
11	Use of Water Resources	x	x	x
12	Accidents	x	x	x
13	Greenhouse Effect Gas	x	x	x

Note: X means “applicable”.

Table 7.1.2 Scoping for IEE-Level Study on Natural Environment

No.	Impacts to be Assessed	Guidelines Requirement	Scoping at S/W Mission (December 2003)	Agreed Scoping at Kick-Off stakeholders Meeting (May 2004)
1	Migration of Population Inventory Resettlement	x	x	x
2	Impact on Local Economy (Employment, Livelihood, etc.)	x	x	x
3	Utilization of Land and Local Resources	x	x	x
4	Social Institution (Social Capital and Local Decision-making institution)	x	x	x
5	Existing Social Infrastructure and Services	x	x	x
6	Vulnerable Social Groups	x	x	x
7	Equality of Benefits and Losses and Equality in Development process	x		x
8	Local Conflicts of Interests	x	x	x
9	Gender	x		x
10	Children’s Rights	x		x
11	Cultural Heritage	x	x	x
12	Infectious Diseases	x	x	x

Note: X means “applicable”.

During the construction period, it is expected to have several disturbances to the river bed condition including benthos due to the bridge pier construction activities to be carried out inside of the Mekong River. So, environmental impacts on the water quality of the Mekong River, local aquatic fauna and fishery around both Neak Loeung deep pool and riffle areas would be critical discussion

points throughout the bio-physical environmental information-based IEE process (note: According to current Cambodian fishery law, the project owner of any development projects that would contain construction activities adjacent to/ or inside of the major tributaries, navigational channel and floodplain area that are important for spawning/ or breeding for migrating fishes must obtain the permission from the MAFF). Also, inundation and subsidence issues related with the approach road construction would become the critical discussion points. Well-planned regional drainage program during the rain season shall be established before the construction will start. It is expected that large amounts of construction waste will be generated, so that it would be quite essential to prepare enough waste disposal sites with proper treatment methods. The roadside air quality and noise may be somewhat deteriorated due to the temporally increase of the local traffic volume (mainly, construction-related heavy vehicles). After the bridge operation will start, most of critical environmental issues to be arisen during the construction period will subdued/ or disappeared, but following environmental impact such as the subsidence around the approach road on both sides and inundation issues would still be the critical discussion points. Also, the erosion of road bank to be caused by the wind-induced wave would not be negligible during the flood period. It is essential to prepare an appropriate road bank protection measures such as the implementation of proper roadside vegetation. Similar environmental impacts identified within the IEE evaluation of the bridge option (except impact to be caused by the inside-river-related construction activities) would be caused at both construction/operation phases of the improved ferry option. Bridges, impacts on the water quality at the operation phase of both ferry options would become critical discussion point to some extents. As a result of the IEE study on social environment, it was revealed that there might have potential impacts on a wide range of the social environment during the construction phase as well as the operation of the bridge option (including the combined option) or the ferry improvement option with an additional pier. The most significant social impact would be a considerable level of the resettlement required for the construction of a bridge or an additional pier. The estimated of PAHs (Project Effected Household) at the time of the IEE –level study ranges from 51 to 70, while that of PAPs (Project Affected Persons) ranges from 263 to 364. Other significant impacts would be loss of income and job opportunities of vendors, retailers and restaurants at the ferry terminals due to abolishment of ferry services.

In addition to these major impacts, other significant impacts would be:

- that the prevalence rate of HIV/AIDS might increase due to the massive inflow of construction workers during the construction phase and the improved mobility of the epidemic through various mobile group of people, being closely related to serious social threats to women and children; and
- that the flood-free land will be created by spaces surrounded by the National Road No.1, the National Road No.11, and an approach road associated with the construction of a bridge or an additional pier and the flood-free land might bring about the economic disparity as well as land disputes in the project affected area.

Based on the comprehensive literature reviews and the collection of the up-to-date baseline information/data, the natural and social environmental conditions around the study area of Neak Loeung were profiled, and potential natural and social impacts were qualitatively and quantitatively identified. In addition, more in-depth field survey covering a wide range of natural and socio-economic information were conducted in order to obtain the full-scale data and information to identify those impacts. Regarding the time range in which potential social impacts were assessed, the Study covered the pre-construction period, the construction period, and the post-construction period under the proposed “Ferry +Bridge option (route A)”. More concretely, the EIA on natural and social environment was based on more in-depth qualitative quantitative data analysis resulting from a series 7.2.1 and Table 7.2.2. of field surveys, thereby assessing the flowing potential natural and social impacts, as shown in Table

Table 7.2.1 Summary of Possible Impacts (Natural Environment)

	Environmental factors	Remarks of Possible Impacts
1	Air quality	1. Dust during the construction period. 2. Future roadside air quality condition after the construction.
2	Water Quality	1. Risk of water pollution to the Mekong River during the construction. 2. Potential of water quality degradation due to the erosion during/ and after the construction
3	Soil and Sedimentation	1. Potential for soil erosion during/and after the construction. 2. Potential of sedimentation due to the erosion during/ and after the construction. 3. Potential of cross-sectional seepage of the approach roads after the construction.
4	Waste Disposal	1. Preparation of excavated soil dump site. 2. Household waste discharged from construction yard during the construction period.
5	Noise / Vibration	1. Noise and Vibration during the construction period. 2. Future the roadside noise and vibration after the construction.
6	Subsidence	1. Potential of subsidence during/and after construction.
7	Bad Smell	1. Bad smell due to the compost smell originated from the decayed plants under inundated water.
8	Topography and Geology	1. Worsened local flood/or inundation after the construction. 2. Risk of malarial, dengue and waterborne disease outbreak from newly created long-term inundated area. 3. Potential of the regional seepage/or recharge from the Mekong River to the regional drainage system of free-flood land during/ and after the construction. 4. Potential of the erosion of the riverbank of the Mekong River.
9	River Bed (e. g., benthos)	1. Disturbance to the river bed condition (e.g., benthos).
10	Flora/Fauna	1. Destruction of natural floodplain vegetation. 2. Disturbance to birds and wildlife the during the construction period. 3. Illegal fishing/or hunting activities by bridge construction workers. 4. Habitat change due to the physical change/or damage on the Mekong River. 5. Risk of pollution to aquatic species during the construction period. 6. Disturbance to animal path after the construction.
11	Water Resources	1. Demolition of shallow wells. 2. Risk of pollution the aquifer during the construction period.
12	Accidents	1. Potential of increased traffic accidents during the construction period. 2. Potential of increased in traffic accidents after bridge operation starts. 3. Undiscovered UXOs or landmines during the construction period. 4. Increased risk of vessel collisions.
13	Global Warning	1. Possible CO ₂ emission reduction after bridge operation starts.

Throughout this EIA study on the natural environment, it was found that potential impacts on the water quality, inundation, and subsidence would not be negligible. Also, it was found that several important reptile species with IUCN “Vulnerable” status occur on the east of The Mekong River, so the conservation of those species is one of important and critical discussion points. As mentioned earlier, the key components of the local fauna/flora conservation of the Mekong floodplain area is to establish well-coordinated link with a basin-wide LMB management program while undertaking education and extension for the general community concerning biodiversity conservation. It is quite essential to establish comprehensive and effective environmental mitigation/management programs during the project-planning phase of this project.

Table 7.2.2 Summary of Possible Impacts (Social Environment)

	Environmental factors	Remarks of Possible Impacts
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No.		
1	Migration of Population Inventory Resettlement	1. Project effected people 2. Involuntary resettlement
2	Impact on Local Economy (Employment, Livelihood, etc.)	1. Possibilities of increase in unemployment due to the decrease in the demand stemming from the stopover at Neak Loeung 2. Impact on local restaurant and retail shops due to the decrease in the demand stemming from the stopover at Neak Loeung
3	Utilization of Land and Local Resources	1. Impact on land use due to the creation of flood-free land 2. Impacts on land value due to the creation of flood-free land
4	Social Institution (Social Capital and Local Decision- making institution)	1. Impacts on communes' and villages' official decision-making process 2. Impacts on other local organization which are involved in communes' and villages' decision-making process
5	Existing Social Infrastructure and Services	1. Impacts on accessibility to educational services 2. Impacts on accessibility to medical services 3. Impacts on accessibility to other administrative and social services
6	Vulnerable Social Groups	1. Impacts on ethnic minorities such as Vietnamese and Muslim people 2. Impacts on physically handicapped people 3. Impacts on jobless people
7	Equality of Benefits and Losses and Equality in Development process	1. Unequal distribution of benefits and losses between the rich and the poor 2. Unequal distribution of benefits and losses between well-located villages and badly-located village
8	Gender	1. Women's unemployment by the abolishment of ferry service 2. Possibilities of occurrence of sexual exploitation on women due to the increase in traffic 3. Other impacts on women's livelihood
9	Children's Rights	1. Possibilities of occurrence of trafficking of children 2. Possibilities of occurrence of child labor 3. Possibilities of increase in children's traffic accidents
10	Cultural Heritage	1. Impacts on religious monuments 2. Impacts on other cultural monuments
11	Local Conflicts of Interests	1. Impacts on other cultural monuments Possibilities of economic conflicts between flooded area and flooded-free area 2. Possibilities of occurrence of other local conflicts stemming from the abolishment of the ferry service
12	Infectious Diseases (HIV/AIDS)	1. Increase in disease (HIV/AIDS) through the construction period 2. Increase in disease (HIV/AIDS) through the increase of the traffic volume

The construction of the bridge will be associated with the abolishment of ferry service, which might have significant economic impacts on economic situations of local stakeholders such as whole sellers, retailers, vendors and etc., unless necessary mitigation measures are taken . Since the portion of sales to drivers and passengers is estimated at relatively large in the business communities such as large markets and relatively small in small-scale business communities such as restaurants and retail shops around the both ferry terminal, the economic impacts might remain trivial in large markets and serious in small-scale business communities. The massive inflow of construction workers for construction of bridge might have significant economic impacts on the local economy. The business community could benefit also if the contractor is encouraged to buy local materials where appropriate. Although it is likely that some dozens of locally-employed workers of the Neak Loeung Ferry might lose their job opportunities, it might be solved by shifting these workers and their families to other ferry-crossing points. The massive inflow of construction workers as well as the mobility effect by the construction of the bridge might aggravate the situation on the spread of HIV/AIDS which has various negative socio-economic impacts, unless sufficient counter-measures are taken. More specifically, the improvement in mobility accrued from the construction of the Bridge might bring

about a risk of increasing the prevalence ratio of HIV/AIDS through activating various mobile groups of people. What is worse, massive construction workers needed for the construction of the Bridge might have a considerable risk of increasing the prevalence ratio of the epidemic through their sexual activities.

Mitigation measure must be incorporated into tender document prepared under the engineering component of this project in order to ensure that the contractor is obliged to comply with measures in the environmental management plan (EMP). The major mitigation measures are as below.

- a) Maintenance of comfortable roadside environment throughout the project.
- b) Alleviation of disturbance of regional hydrological balance, in particular, drainage system, and to lessen related secondary impacts such as inundation.
- c) Alleviation of secondary impacts of a large-scale subsidence around the approach roads on both sides of the Mekong River.
- d) Minimize the risk of the erosion of road bank of approach roads, that may lead to new local inundation or water quality degradation, and the erosion of the riverbank of the Mekong River.
- e) Alleviation of disturbance of natural fauna/flora condition over the Mekong floodplain and inside of the Mekong River throughout the project.
- f) Harmonization of new transport facilities with surrounding communities. On the other hand, the major monitoring activities for the impacts. The purpose of the noise and vibration monitoring is to limit nuisance to local residents and to the workforce, and the noise should be measured frequently during the construction. Potential sources of the noise include a heavy construction plant and vehicles. An ad-hoc approach should be taken, depending on the type of activities in progress and their location on site in relation to sensitive receivers. Background noise and vibration level must be measured before the project commencement. Parameters to be monitored for the noise and vibration are L_{eq} (dBA) and L_{10} (dB), respectively. Remedial measures will be taken when L_{eq} value exceeds the Cambodian environmental standard. In Cambodia, no environmental standards for vibration is established, yet, but it would be likely to have property damage due to the roadside vibration to some extents when the traffic volume will be increased during both construction and operation periods. So, it is wise to use other ISO-based vibration standards such as the one implemented in Japan for the vibration monitoring.

The objective of dust monitoring is to control nuisance to both local residents and the workforce on site. Monitoring site should be located in areas where there are sensitive receivers. Generally, the dust generation is the most severe along unpaved access roads and at area where loose materials are handled (e.g., industrial waste site, stockpiles and so on). Based on those facts, the monitoring station sites should be determined. Parameter to be monitored is PM-10 and/or the weight of the dust accumulated within a specific time period (e.g., 1 week -1 month). Background dust level must be measured before the project commencement, and remedial measures will be taken where more than 50% increase of the background dust level occurs when PM-10 value exceeds the Cambodian environmental standard.

The objective of the groundwater monitoring is to observe a change in the regional water balance during the construction. Several monitoring wells should be installed in order to establish a proper monitoring network, and the monitoring will determine whether there is a severe drawdown/or uprising that will be lead to regional aquifer consolidation/or vegetation change.

Parameter to be monitored include: organoleptic conditions such as color and odor; physico-chemical Characteristic such as turbidity, conductivity, sulfate and aluminum content; undesirable substance such as nitrates and hydrocarbons; toxic substance such as chromium, lead and pesticide. Polluted discharge from road surface can be assessed either by heavy metal content, oil or suspended matter. Also, spillage of untreated household effluents can be detected by BOD, COD, coli-form, grease and other common parameters.

It is essential to have periodical water quality tests during the construction phase of the project in order to check the water quality pumped from excavation and discharges from construction sites, and to monitor the effects of any localized pollution due to human activities and spills. In particular,

intense water quality monitoring program should be around the project site of the Mekong River. Monitoring of water of the ambient water quality will determine whether there are likely to be problems for downstream uses, whereas monitoring of the effluents will help to identify the source of the problem and the remedial action. Parameters to be monitored should reflect the type of contaminants likely to be detected. For example, contamination caused by the concrete may be detected through increased pH levels.

It is essential to prepare a proper field surveillance/or monitoring program in order to establish a well-managed conservation pond and to avoid/or lessen the occurrence of illegal hunting therein. As described in previous section, the alternative site for the conservation pond is ex-old river and several ponds and natural vegetation already long exist. So, construction itself (e.g., set-up of fence and signboard) would not take relatively long time nor huge man power, and it is expected to this newly created conservation pond would become full-fledged sanctuary within relatively short time period. However, it is recommendable to assign a special trained-personnel/or field officer in the regional office for the periodical on-site check of the conservation pond status (e.g., direct observation of pond, water quality, number of turtle recognized within this pond, occurrence of any damages on fence and so on).

Apart from the measures to mitigate the impacts on natural environment which are incorporated into tender document prepared under the engineering component of the project in order to ensure that the contractor is obliged to comply with measures in the environmental management plan (EMP). The impacts on the social environment should be mitigated with the assistance of the line ministries and agencies. While the mitigation measure for the involuntary resettlement is separately discussed in the RAP, the mitigation measures for the major social impacts are proposed as follows.

- a) Comprehensive Michi-no-eki Development Program
- b) Smooth Transfer and Training Program Neak Loeung Ferry Staff
- c) Participatory Maintenance of Roads near the Bridge for Creation of Economic Opportunities
- d) Credit and saving program for small-scale Business for local Traders and Farmers
- e) Comprehensive HIV/AIDS prevention package for construction workers and local communities

A Resettlement Action plan (RAP) is a document required for any project which results in the physical resettlement of people and it must specify the procedures and actions it should take in order to properly resettle and compensate the affected people and communities. It is required as a minimum condition that a RAP must ensure that their incomes and living standards of the affected people are restored to pre-project levels and are not worse off than they would have been without the project. More specifically, a full-scale RAP should be prepared as a detailed plan for mitigating the land acquisition impacts, the largest social impact, by the ferry plus bridge option of 2nd Mekong Bridge Project in an attempt:

- to ensure that the social and economic of the affected people is recovered at least the pre-project level;
- to provide policy and procedural guideline for the acquisition of land and other assets compensation, and resettlement;
- to identify households that will be adversely affected by the project, where they are located, what compensation and alleviating measures are to be provided and how and when these measures will be implemented.
- to provide a plan on for the community participation of the PAPs could be involved in the various stages of the project, including the implementation of the RP; and
- to estimate an overall budget of the required resources needed and the actual assessed compensation to implement the RAP.

When drafting the NRP, it has been pointed out that there are considerable gaps between Cambodia's present legal framework and the international best practices as shown below.

- Compensation for land and assets is performed without a comprehensive legal framework, using the resettlement plans or simply a governmental authority's discretion. There are no ample rules and

procedures for compensation or valuation other than what may be contained within a resettlement in Cambodia.

- while an individual's rights to ownership and compensation are protected as defined under the various articles, there is no clear-cut mechanism for the land acquisition and amounts of compensation. At present, there is no formally established policy for resettlement in Cambodia.

- There are no effective regulations on how to determine whether compensation is just or fair.

- There are no clear-cut procedures and guidelines to guide development of the implementation plan and how the livelihood of recipients is restored after moving to the uncertain resettlement sites.

- Livelihood and income restoration is still limitation stating by the current domestic laws and policies. There has been insufficient effort to address income restoration so that PAPs who are left without a source of income are assisted to restore that income to its pre-project level.

Cambodia, donors are extending cooperation on ad-hoc basis, depending on particular donors' specific requirements.

However, the Government of Cambodia is in a transitional position, trying to fill the gap between the international best practices and the existing policy with assistance of donor agencies. Therefore, it should be noted that the proposed RAP should be more realistic and practical approach for Cambodia's smooth transition to the right track. Through the application of its own guideline to actual project.

Chapter 1

Outline of the Study 오류! 책갈피가

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Appendices

- Appendix 1 Traffic Survey
- Appendix 2 EIA Monitoring Survey

Refer by the document of study on the construction of the second Mekong Bridge in the Kingdom of Cambodia. January, 2006